

PROGRESS REPORT  
FOR  
NORSAR PHASE 3  
COVERING  
3rd QUARTER 1970\*  
STATUS PER 30 SEPTEMBER 1970

Our reference: NTNF/NORSAR  
Report No. 2

Norwegian Seismic Array

**NORSAR**

P.O. Box 51. 2007 Kjeller - Norway

ROYAL NORWEGIAN COUNCIL  
FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

Kjeller, 31 October 1970

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The NORSAR project has been sponsored by the United States of America under the overall direction of the Advanced Research Projects Agency and the Technical Management of the Electronic Systems Division, Air Force Systems Command.

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Since NDRE will not submit their own PROGRESS REPORT for 3rd Quarter 1970 (Contract F61052-68-C-0060 has been extended to 31 October 1970), this NTNF PROGRESS REPORT will also cover any relevant information from NDRE.

Name of Contractor : Royal Norwegian Council  
for Scientific and Industrial  
Research.

Date of Contract : May 15, 1970.

Amount of Contract : \$ 1 300 883,-.

Contract No : F19628-70-C-0283.

Contract Termination Date : June 30, 1972.

Project Supervisor : Robert Major, Director NTNF.

Project Manager : Eivind Sætre, NTNF.

Title of Contract : NORWEGIAN SEISMIC ARRAY  
(NORSAR) PHASE 3.

Superintendent H. Nødtvedt, Division for Underwater Warfare, NDRE Horten, and Undersecretary O. Værnø, Ministry of Foreign Affairs.

Director R. Major of NTNF attends the meetings. Project Manager E. Sætre acts as the Board's Secretary.

## 2.2 Organization Plan

The organization of the NORSAR Project under NTNF was ratified by the NORSAR Board at a meeting on 11 August 1970. A tableau dealing with the above-mentioned plan is shown in Appendix No.1. (A more detailed organization tableau for the Operation Group is shown in Appendix No. 1B).

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./1B

## 2.3 Administration

As a result of NTNF's undertaking of the complete operation of NORSAR, and the fact that the NTNF Headquarters are situated some 25 kilometers from Kjeller, the administration of the project is now run as an independent unit.

To meet the requirements this reorganization involves, it has been necessary to establish a record office and expand the administration staff (this will be an overhead item), in order to take care of all the functions associated with an independent administration.

## 2.4 Personnel

Per 30 September 1970 30 positions in the NORSAR group out of 35 are filled.

Recruiting of highly qualified programmers has been difficult. Regarding system and computer operators the situation is satisfactory.

## 3 CONTRACT NEGOTIATIONS

### 3.1 Contract between NDRE and The Norwegian Telecommunication Adm. Board (NTA) NORSAR - Phase 2

A contract between NDRE and the Norwegian Telecommunication Administration Board (NTA) regarding installation and

erection of data communication lines between NORSAR Data Processing Center (NORSAR DPC) and the subarrays was signed 14 October 1970.

3.2 Renting of Datalines - NORSAR Phase 3

NTNF/NORSAR will rent datalines when NTA's work is completed in October/November 1970. At that time a contract between NTNF and NTA will be established.

3.3 Erection of a Maintenance Center including 4 Moelven huts - NORSAR Phase 2

Erection of a Maintenance Center for NORSAR is under way. 4 Moelven huts, previously located at the subarrays OLC (Øyer) and 11C (Lomsdalen), will be assembled and form part of the Maintenance Center.

3.4 Procurement of additional instruments for the Maintenance Center - NORSAR Phase 2

Subject to the Contracting Officer's consent the NORSAR Maintenance Center's instrumentation will be expanded. A request has been forwarded to the Contracting Officer.

3.5 Establishment of a contract between NDRE and Noratom-Norcontrol A/S - NORSAR Phase 2

A contract will, assuming the Contracting Officer's consent, be established between NDRE and Noratom-Norcontrol A/S for the tasks described under subsection 3.3 and 3.4.

3.6 Establishment of a contract between NTNF and Noratom-Norcontrol A/S - NORSAR Phase 3

A contract covering field maintenance will be established between NTNF and Noratom-Norcontrol A/S for the period 1 July 1970 - 30 June 1971. A proposal for this contract was sent to the Contracting Officer for his approval 18 September 1970.

4 OPERATION AND MAINTENANCE GENERAL PROGRESS

4.1 Construction work

In the period, only minor correction work has been carried out. Otherwise, the construction work is considered finished.

4.2 Installation and Check-out

9 SLEM units are installed in the field, at subarrays 01B, 02B, 03B, 07B, 01C, 02C, 05C, 09C and 14C. These subarrays are undergoing field tests. Of the remaining 15 SLEMs 5 are ready for field installation, 6 have certain technical problems yet to be solved, and 4 awaiting pre-field testing at the NORSAR DPC.

4.3 Field Tests

Field tests have uncovered certain problems with seismometres, amplifiers and other installations. The maintenance sub-contractor Noratom-Norconsult A/S, is continuously working in the field correcting deficiencies.

4.4 LP - Installation at the remaining Subarrays 04C and 11C

LP-installations at the remaining 2 subarrays 04C and 11C are completed.

4.5 Installation of Modems

All field modems are installed. 12 ea DPC modems are installed, the rest are at present undergoing tests at NTA.

4.6 Data Communication Lines

Data communication lines are being tested. 11 lines have been brought up to specifications. All equipment (equalizers, amplifiers, etc.) has been installed.

4.7 NORSAR DPC equipment

All equipment has been installed at the DPC, and is undergoing tests (IBM).

4.8 Frequency/Temperature Studies

Studies are being carried out on SP-Seismometer frequency/temperature problems.

5 RESEARCH AND DEVELOPMENT - GENERAL PROGRESS

5.1 In accordance with the contract between NTNF and KCIN which terminated 31 August 1970 it was originally decided that KCIN should prepare a progress report covering July/August. NTNF should be responsible for covering the activities in September. For practical reasons, however, the activities during the entire period are considered together and therefore covered by one report. Reference is made to Appendix No. 2.

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6 MISCELLANEOUS

6.1 Visitors to NORSAR during the period are shown in Appendix No. 3.

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6.2 NORSAR personnel abroad. Reference is made to Appendix No. 4.

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6.3 The Philco-Ford representatives Mr. H. Martin and Mr. A. G. Christensen who have been in Norway since the end of May 1970, in connection with activities related to the integration of SLEM into the Norwegian Seismic Array, will leave Norway in week 43.

6.4 21 IBM employees are at present engaged in activities related to SLEM integration into NORSAR and DPC equipment. The work carried out by IBM is covered by Contract F19628-68-C-0400.

7 EXPENDITURES IN THE PERIOD 1 JULY - 30 SEPTEMBER 1970

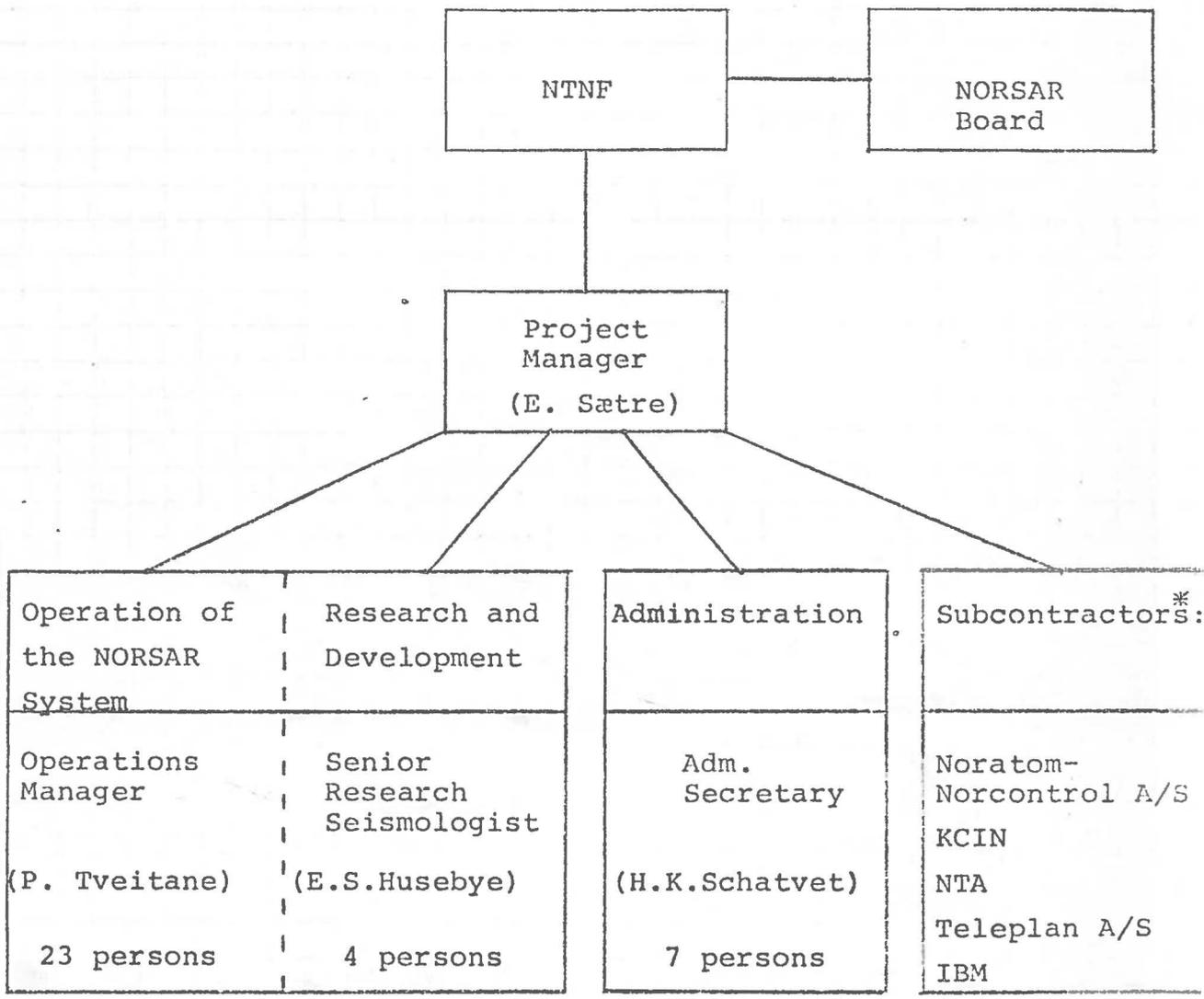
./5 Appendix No. 5 shows the expenditures in the period 1 July - 30 September 1970.

For NORSAR

  
Eivind Sætre  
Project Manager

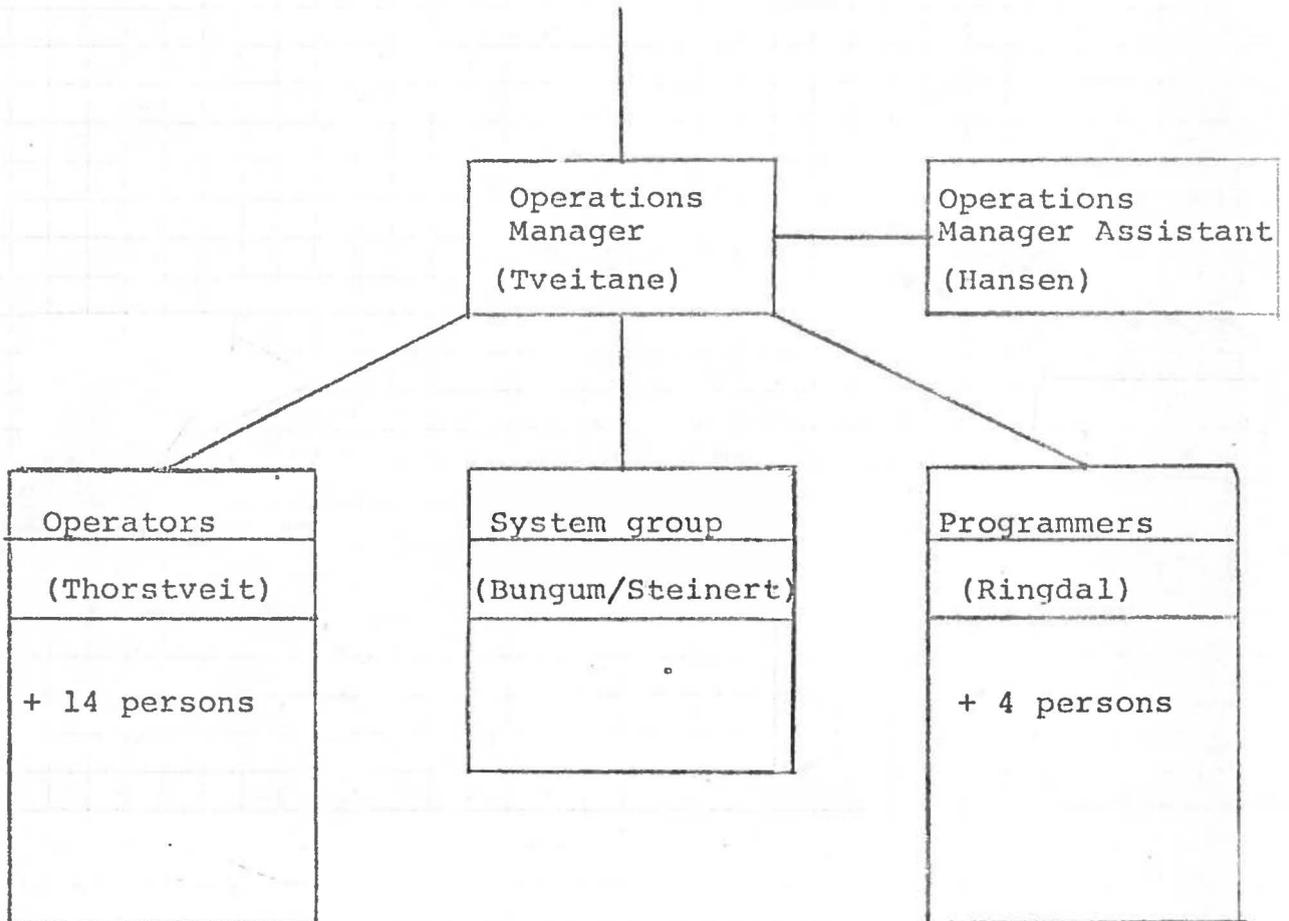
Enclosures: 5

Tableau showing the NORSAR-Project Organization.  
 Ratified by the NORSAR Board at a meeting  
 11 August 1970.



\* The daily contact will be mainly through the Operation Group.

Tableau showing the organization of the Operation Group:



NORSAR DPC Research

Our research efforts in the period under review have been tied to NORSAR system software and continued analysis of Plan D data. Concerning the Event Processor (an IBM draft description received in Sept. 70) our goal is to achieve an intimate knowledge of the individual analysis tasks, and emphasis is on built-in parameters. We are here cooperating closely with IBM/SAAC personnel at NORSAR DPC. A short description of specific research topics is as follows:

1. System parameters

An investigation of possible biased errors in time delay measurements has been completed, and a special technical report is in press. We take part in time delay measurements, based on Plan D events, and subsequent building of a steering delay library for beam deployment usage. A proposal for regional NORSAR surveillance has been submitted to ESD/TPO. Based on preliminary analysis of signal power distributions across the array, we recommend that 8 subarrays in the North-eastern quadrant are used for the general surveillance task. The latter configuration is likely to give a relative signal power gain which in average amounts to around 2 dB.

Other system parameters under investigation are proper band pass filtering as a function of seismic regions. The procedure adapted here is a mapping of rectified signal power (time domain) in a so-called filter space. The latter consists of a large number of band pass filters having different center frequencies and bandwidths. Analysis of around 10 events from different regions favors a filter pass band around 1.3 - 3.7 Hz



3. Miscellaneous

A paper on lateral P-velocity variation in the deep mantle will be completed in the near future. H. Bungum and E. Husebye participated in a symposium in Stockholm (two talks given) arranged by the Upper Mantle Committee, and in the general assembly of the European Seismological Commission (ESC) (three talks given) in Luxembourg.

Papers on which the above talks were based, will be published in journals recommended by the respective meetings.

## VISITORS TO NORSAR 3rd QUARTER 1970

6-7 August	Professor H. Jarosch, Rehovot, Israel.
8 "	Excursion for participants of the Symposium on Antarctic Geology and Solid Earth Physics.
14 "	Dr. J. Pfluke, ESSA, California.
28 "	Members of the Danish and Norwegian Disarmament Committee.
29 "	Drs. D. Davies and J. Filson, Lincoln Laboratories.
31 "	Mr. J. Hjelme, Section Manager, Copenhagen.
3-4 September	Professor E. Vesanen and Col. Øhman, Finland
14-20 "	Property Administrator E. H. Arechiga, US Air Force
1-30 September	Dr. A. K. Ibrahim, NTNF Scholarship.

## NORSAR PERSONNEL ABROAD 3rd QUARTER 1970

- 16-28 August UMC Symposium in Stockholm.  
Participants: Dr. E. Husebye, Mr. F. Ringdal  
and Mr. H. Bungum. (KCIN Report No. 29)
- 20-29 Sept. Symposium No. XII arranged by the Commission  
Seismologique Européen in Luxembourg.  
Participants: Dr. E. Husebye and Mr. H.  
Bungum. (NTNF/NORSAR Report No. 1).

Appendix No. 5

EXPENDITURES IN THE PERIOD 1 JULY - 30 SEPTEMBER 1970

1	Operation and maintenance		
	1.1 Data Processing Center	\$ 185,90	
	1.2 Field Installations	\$ 33.560,10	
	1.3 Data Communication System	\$ <u>0,00</u>	\$ 33.746,-
2	Research and Development		\$ 132,45
3	Administration and Support		\$ <u>5.671,15</u>
	TOTAL		\$ 39.549,60 =====

(Exchange rate: 7,13)